

# Unlocking the



# Food Biotechnology Mystery



# Unlocking the Food Biotechnology Mystery

**OVERVIEW:** This individualized project is designed to give you an opportunity to explore the area of food biotechnology. Throughout this project you will be locating and using resources to gather information about food biotechnology. Biotechnology affects many aspects of our food supply yet many people do not know about biotechnology and its effects. This project will allow you to become informed about food biotechnology and use this information to inform others.



**OBJECTIVES:** The student will:

- ❖ Explore the area of food biotechnology.
- ❖ Practice locating reliable resources concerning food biotechnology.
- ❖ Demonstrate ability to use resources concerning food biotechnology.



**GRADING:** The entire individualized project is worth 150 points. The required activities are worth 75 points. You will have the opportunity to earn the other 75 points by completing optional activities.

To Earn an **A** you must:

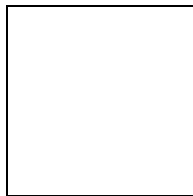
Complete all required activities + 5 optional activities

To Earn a **B** you must:

Complete all required activities + 4 optional activities

To Earn a **C** you must:

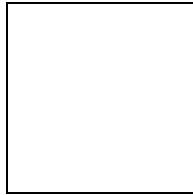
Complete all required activities + 3 optional activities



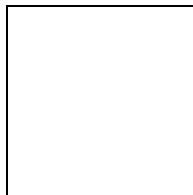
All activities must be completed to meet satisfactory standards to achieve the full points. Each activity will be graded on completeness of information and on overall neatness. Additional standards may be stated in some of the activities.

**DIRECTIONS:**

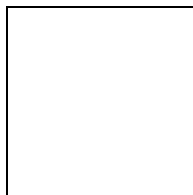
1. Read over the ENTIRE individualized packet and decide what grade you would like to achieve. Sign the contract that is located at the end of the packet and turn into Ms. Weisz by April \_\_\_\_\_, 2001. You will have three days after turning in the contract to renegotiate for a different grade.



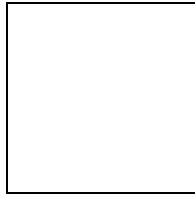
2. Three class days will be devoted to working on this project. The rest of the time needed to complete the project will need to be done on your own outside of class.



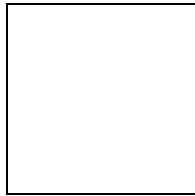
3. You will have one week after class time to complete the individualized project. Projects will be docked according to class rules for late assignments.



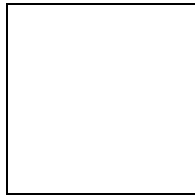
4. Each activity should be turned into Ms. Weisz after it has been completed. They should be placed in the tray on the corner of her desk. Each activity will be graded according to the criteria outlined on the attached grade sheet. Ms. Weisz will return all assignments and materials to you after the entire packet has been graded.



5. Please put your name and date of completion on each activity that is turned in.



6. All resources to complete the activities are located on the back counter in folders. The folders are numbered according to the packet activity numbers.

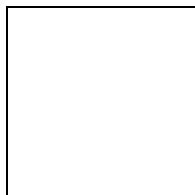


7. The project is due April \_\_\_\_\_, 2001.

### **LEARNING ACTIVITIES**

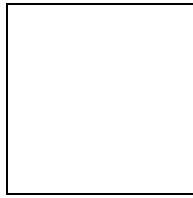
#### **REQUIRED ACTIVITIES:**

1. Complete the quiz on biotechnology located in folder #1. AFTER completing the quiz, check your answers with the answer sheet also located in folder #1. After checking your answers return the answer sheet to the folder, and write a 1-2 paragraph reaction to the quiz questions. Did the answers surprise you? Why? Which questions did you know? Staple the completed quiz and paragraph together and turn in. (10 points)

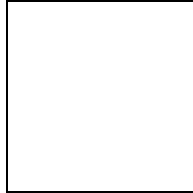


2. Read both of the articles located in folder #2. The articles are labeled #1 and #2. After reading these articles, answer the questions on the Biotechnology

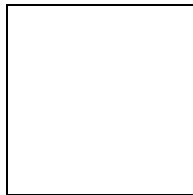
Basics worksheet. Turn in the worksheet and keep the articles for future references. (20 points)



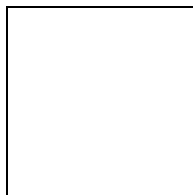
3. Complete the Internet search activity located in folder #3. (20 points)



4. Develop a crossword puzzle using terms and definitions related to food biotechnology. You must include a minimum of 15 words and definitions in the puzzle. The crossword puzzle can be either done by hand or computer generated. (Hint: A good source for creating crossword puzzles is [www.puzzlemaker.com/](http://www.puzzlemaker.com/)) Both an incomplete puzzle and a completed puzzle need to be turned in. (15 points)



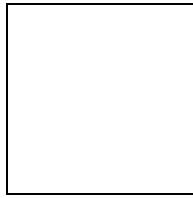
5. Develop a list of five foods that you would genetically alter using biotechnology. State what the food is, what you would do to this food to make it a more appealing product, why you would do this, and why people would want to eat this food. (10 points)



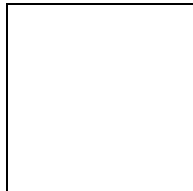
**OPTIONAL ACTIVITIES:**

6. Using one of the foods you developed in activity #5 develop an advertising poster. The poster needs to mention that the food has been genetically altered.

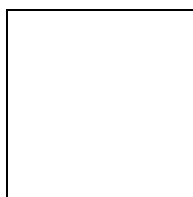
The poster needs to be eye-catching and it should target the right group of consumers. (15 points)



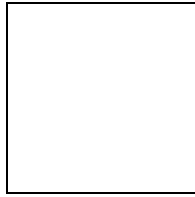
7. Read the article Food Fight! located in folder #7. After reading the article, develop a T-chart listing the advantages and disadvantages of biotechnology. You need to have a minimum of seven advantages and seven disadvantages. Your chart should be in the following format. (15 points)

Advantages	Disadvantages
	

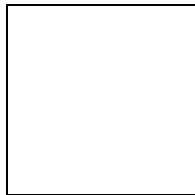
8. Develop a brochure that could be distributed to consumers telling them about the biotechnology. The brochure should include an explanation about what biotechnology is, benefits of biotechnology, and some examples of biotechnology happening in the world around us. It should also give consumers suggestions on where to get more information. Make sure to document any resources used somewhere in your brochure. The brochure needs to be computer generated. (15 points)



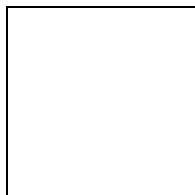
9. Using the library or Internet as resources, find an article about how to grow foods using hydroponics. After reading the article, construct a list of simple directions on how to grow food with hydroponics. Turn in the article and the list of instructions. (15 points)



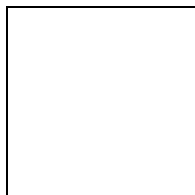
10. Write three slogans that would promote the use of biotechnology to consumers. After writing the three slogans, pick one of them to put in a final form that could be given to consumers. Examples of final form would be a poster, a key chain, a bumper sticker, etc. Turn in the three slogans and the final product. (15 points)



11. Survey 15 people and ask them if they know what biotechnology means. Record their names and answers on a piece of paper. You must interview at least 10 adults and you cannot interview the same person that another classmate has interviewed. (15 points)



12. Using the library or Internet, find a minimum of two resources about how food biotechnology will affect the world hunger problem. After completing your research write a 2-3 page paper that summarizes the information that you found. (15 points)



**RESOURCES:**

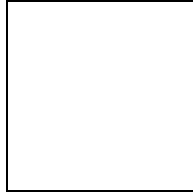
Council for Biotechnology Information, [www.whybiotech.com](http://www.whybiotech.com)

International Food Information Council, <http://ificiinfo.health.org>

National 4-H Council, [www.fourhcouncil.edu/ycc/ffg/FSCI.html](http://www.fourhcouncil.edu/ycc/ffg/FSCI.html)

The Alliance for Better Foods, [www.betterfoods.org/](http://www.betterfoods.org/)

University of California-Davis Center Consumer Research, <http://ccr.ucdavis.edu>

**ADVICE TO STUDENTS:**

The above websites would be excellent resources for finding information to complete your activities. Many of these websites also have links to other websites containing information about food biotechnology.

## GRADING CRITERIA

### REQUIRED

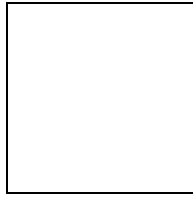
		Points Earned	Date Completed
1.	Both quiz and paragraph are turned in. Paragraph addresses the questions mentioned in the assignment and correct spelling and grammar are used. (10 points)		
2.	<u>Biotechnology Basics</u> worksheet is completed with 90% accuracy. (20 points)		
3.	<u>Biotechnology Internet Search</u> is completed with 90% accuracy. (20 points)		
4.	Both an incomplete puzzle and completed puzzle are turned in. Puzzle contains at least 15 words and definitions. (15 points)		
5.	Minimum of five genetically altered foods are included on the list. The food name, what is being done to the food, why it is being done, and why people would want this food is included for all five foods. (10 points)		

### OPTIONAL

		Points Earned	Date Completed
6.	Poster is eye-catching and shows evidence of creativity. States that the food has been genetically altered. Correct grammar and spelling are used. (15 points)		
7.	T-chart includes a minimum of seven advantages and seven disadvantages. The information is complete and accurate. (15 points)		
8.	Brochure explains what biotechnology is, the benefits of biotechnology, and give examples of biotechnology. The brochure also gives suggestions of where consumers can obtain more information. Brochure is computer generated and correct spelling and grammar are used. Brochure is eye-catching and shows evidence of creativity. (15 points)		
9.	Both the article and list of instructions are turned in. The instructions are complete and accurate enough that a person could follow them to grow an item using hydroponics. (15 points)		
10.	Slogans show evidence of creativity. All three slogans are turned in along with one slogan in some final form. (15 points)		
11.	Minimum of 15 people are interviewed with at least 10 adults interviewed. There is no duplication of people being interviewed. (15 points)		
12.	Minimum of 2 resources used for the paper. Paper is 2-3 pages long. Correct spelling and grammar are used.		

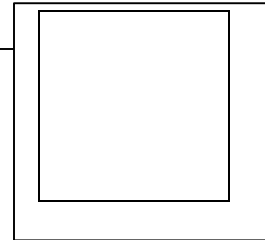
Grade Earned \_\_\_\_\_

Total Points \_\_\_\_\_



Individualized Packet  
Unlocking the Food  
Activity #1

Learning Contract  
For Individualized Packet



Name \_\_\_\_\_

## "Unlocking the Food Biotechnology Mystery"

I have read the directions and grading policy for the individualized packet and plan to work for the \_\_\_\_\_ grade. I will complete all assignments listed for that grade, in an acceptable manner determined by the instructor and outlined in the grading criteria.

1. Biotechnology
  - a) using r
  - soil
  - b) using r
  - c) a rare
  - d) a tech

such as rocks and  
to make things

Signed this \_\_\_\_\_ day of \_\_\_\_\_, 2001.

2. Circle all the
  - a) bread \_\_\_\_\_
  - b) cheese \_\_\_\_\_
  - c) penicillin \_\_\_\_\_
  - d) delayed \_\_\_\_\_

Student's Signature

Instructor's Signature

3. Genetic engineering
  - a) changing
  - b) the deliberate transfer of genes between and among species by humans
  - c) changing stones into living things
  - d) dependent on finding and moving DNA

4. To make a pea plant that produces more peas, we could (circle all that apply):
  - a) selectively breed pea plants that produce a lot of peas with each other

- b) use glue to stick many pea pods onto a plant
- c) feed a plant lots of fertilizer and hope it will produce lots of peas
- d) assuming we could locate and isolate the genes that could make more peas, transfer them to our plant

5. Biotechnology began:

- a) about five years ago
- b) about 35 years ago
- c) about 135 years ago
- d) more than 10, 000 years ago

6. Genetic engineering techniques have been used to selectively move genes between living organisms:

- a) for about 5,000 years
- b) for about 100 years
- c) for about 25 years
- d) haven't been developed yet

"Field of Genes: Making Sense of Biotechnology in Agriculture" Curriculum  
Produced by the National 4-H Council  
Individualized Packet  
Unlocking the Food Biotechnology Mystery  
Activity #1

# Biotechnology Quiz

## ANSWER SHEET

1. Biotechnology is (circle one):
- a) using nuclear power to make life from nonliving things such as rocks and soil
  - b) using microorganisms, plant cells, or other living things to make things
  - c) a rare species of owl
  - d) a technique that uses lightning bolts to create new life

ANSWER: b

2. Circle all the things below made using biotechnology:
- a) bread
  - b) cheese
  - c) penicillin
  - d) delayed-ripening tomatoes

ANSWER: a, b, c, and d

3. Genetic engineering is (circle all that apply):
- a) changing living things by changing their genes
  - b) the deliberate transfer of genes between and among species by humans
  - c) changing stones into living things
  - d) dependent on finding and moving DNA

ANSWER: a, b, and d

4. To make a pea plant that produces more peas, we could (circle all that apply):
- a) selectively breed pea plants that produce a lot of peas with each other
  - b) use glue to stick many pea pods onto a plant
  - c) feed a plant lots of fertilizer and hope it will produce lots of peas
  - d) assuming we could locate and isolate the genes that could make more peas, transfer them to our plant

ANSWER: a and d. C might work, but over-fertilizing a plant won't always make it produce more fruit. It may just increase the amount of leaves and stems, assuming it isn't killed by too much fertilizer

5. Biotechnology began:
- a) about five years ago
  - b) about 35 years ago
  - c) about 135 years ago
  - d) more than 10, 000 years ago

ANSWER: d. Biotechnology is old. Our ancestors made wine and bread using yeast thousands of years ago.

6. Genetic engineering techniques have been used to selectively move genes between living organisms:
- a) for about 5,000 years
  - b) for about 100 years
  - c) for about 25 years
  - d) haven't been developed yet

ANSWER: c. Modern selective genetic engineering began in 1972, when two researchers chemically cut a fragment from one source and spliced it into another.

"Field of Genes: Making Sense of Biotechnology in Agriculture"  
Curriculum Produced by the National 4-H Council  
Individualized Packet  
Unlocking the Food Biotechnology Mystery  
Activity #2

# Biotechnology Basics

1. List three crops that are currently being produced using biotechnology.
2. What is meant by selective breeding and hybridization of crops?
3. What is the benefit of biotechnology on the environment?
4. Explain how rennet is being produced using biotechnology.
5. List three current benefits of biotechnology.
6. How have tomatoes been enhanced through biotechnology?

7. Describe two of the products that will soon be on the market due to the advances of biotechnology.

8. What is the world's population estimated to be by the year 2050?

9. How will advances in biotechnology assist in preventing starvation during the next century?

10. What is one future benefit that can be expected due to biotechnology?

Developed by Lisa Weisz, 2001

Individualized Packet  
Unlocking the Food Biotechnology Mystery  
Activity #2

# Biotechnology Basics

## ANSWER SHEET

1. List three crops that are currently being produced using biotechnology.

*Soybeans, corn, canola, tomatoes, squash, potatoes*

2. What is meant by selective breeding and hybridization of crops?

*Transfer of only one or a few desirable genes, thereby permitting scientists to develop crops with specific beneficial traits and those without desirable traits.*

3. What is the benefit of biotechnology on the environment?

*Insect-protected crops reduce the need for pesticide use. Preserve topsoil.*

4. Explain how rennet is being produced using biotechnology.

*The specific gene that produces rennet is removed and reproduced in bacteria. This is done through a fermentation process, eliminating the need for extracts from calves' stomachs.*

5. List three current benefits of biotechnology.

*Disease resistance, reduced pesticide use, more nutritious composition of foods, herbicide tolerance, more rapid growth of crops, improvements in taste and quality*

6. How have tomatoes been enhanced through biotechnology?

*Soften slower and remain on the vine longer, resulting in more flavor and color*

7. Describe two of the products that will soon be on the market due to the advances of biotechnology.

*Answers will vary, see article for correct responses*

8. What is the world's population estimated to be by the year 2050?

*10 billion people*

9. How will advances in biotechnology assist in preventing starvation during the next century?

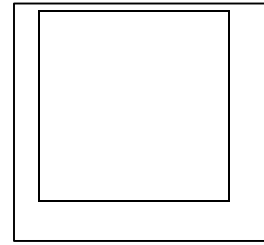
*Increases crop's ability to withstand environmental factors, which will allow growers to farm in parts of the world that are currently unsuitable for crop production. This will allow for more crop production. This would also provide developing countries with much-needed jobs and greater productivity.*

10. What is one future benefit that can be expected due to biotechnology?

*Producing safer foods through reduction of allergenic proteins, drought and flood tolerance, salt and metals tolerance, heat and cold tolerance*

Developed by Lisa Weisz, 2001

Individualized Packet  
Unlocking the Food Biotechnology Mystery  
Activity #3



**Directions**

Find the answers to the following questions using only the Internet as a source. For every question, list the website address where the information was found.

## Biotechnology Internet Search

1. What agency is responsible for overseeing the safety of foods that are altered using biotechnology?
2. How will foods produced through biotechnology be labeled? In what instances would labeling be required?
3. What are three myths related to biotechnology? Why are they myths?

4. What is hydroponics?

5. What is meant by the term food irradiation?

6. Find three websites related to the area of food biotechnology. (Do not use any of the sites that are listed on the resource list provided in your packet.) For each site:

- a. Tell who sponsors the website
- b. Tell when was the site last updated
- c. Explain what type of information is provided on the website
- d. Explain if you feel that the information is reliable

7. Write two questions that you have concerning the area of food biotechnology. After writing your questions, use the Internet to find the answers to your questions.

Developed by Lisa Weisz, 2001